

Student X

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COMS 160

## Vaccines: Should Children Be Vaccinated?

### Part 1

“Vaccine: [vak-seen] (noun) 1. any preparation used as a preventive inoculation to confer immunity against a specific disease, usually employing an innocuous form of the disease agent, as killed or weakened bacteria or viruses, to stimulate antibody production.” (Dictionary.com, 2014) The one thing this definition does not provide is the possibility of vaccines being ineffective. Vaccines were once thought to be the greatest medical advancement in recent history, but now there is some speculation to that notion. Vaccines have become a very controversial topic as more and more people have adopted the natural immunity way of living. This paper will address both the issues and commonplaces that arise when discussing vaccines.

Should we vaccinate our children? That has been our “Question of Value” all semester. It’s the main issue of vaccines. One side believes that we should give our children vaccines; the other side believes that we should not. Which side is right? That’s unknown, and a completely different topic. What is known is that there are two main sides: pro-vaccines and anti-vaccines. Even with all of the disagreement between the two sides, they can both agree on one major commonplace. The overall health of children is very important. Parents want to ensure the best,

healthy life for their children. One side believes that this objective is achieved with the assistance of vaccinations and the other believes it is achieved without vaccinations.

The biggest issue present besides the Question of Value is the issue with the ingredients contained in vaccines. The main question around this issue is, “Are the ingredients used in vaccines safe?” Parents are worried that there could be harmful ingredients in vaccinations given to their children. Parents are concerned about why we are giving our children vaccines that contain thimerosal/mercury, formaldehyde, and aluminum. The contents of vaccines leads to another issue: “Is there a link between autism and vaccines?” Some people on the anti-vaccine side believe that ingredients such as thimerosal, which contains mercury, cause a very serious mental disorder known as autism. Pro-vaccine side says there is no link. “However, in 2001 thimerosal was removed or reduced to trace amounts in all childhood vaccines except for one type of influenza vaccine, and thimerosal-free alternatives are available for influenza vaccine. Evidence from several studies examining trends in vaccine use and changes in children does not support such an association between thimerosal and autism.” (CDC, 2014a) The pro-vaccine side not only believes there is no link between thimerosal and autism, but they also know that the dangerous ingredients in vaccines are actually reduced to miniscule amounts rendering them harmless. Anti-vaccine believes that even though thimerosal/mercury has been removed or reduced, what about the other ingredients? This doesn’t fully exempt vaccines from its relation to autism. They believe that there needs to be more research done on vaccines in the United States. This is actually a commonplace between both sides. There is too much unknown when dealing with vaccines. There has been some research but there needs to be more so that we may make a better decision.

The next issue between the two sides is, “How effective is a vaccination?” It was once believed that vaccines were 100% effective and that they lasted forever. We are just recently learning that this is not the case. “Studies indicate that immunologic memory remains intact for at least 20 years among healthy vaccinated individuals who initiated Hepatitis B vaccination >6 months of age.” (CDC, 2014b) Hepatitis B is only one of many vaccines that don’t last a lifetime. “Vaccines work really well. Of course, no medicine is perfect but most childhood vaccines produce immunity about 90 - 100% of the time.” (Vaccines.gov, 2014) Both sides tend to use both pieces of new information as support for their own argument. Anti-vaccine believes that the fact that it doesn’t last a lifetime and that it isn’t a guarantee of protection as reason to not get vaccinations. The fact that there is even an amount of risk dismays some parents. The fact that vaccines carry risks is a commonplace between both sides. Most medicine carries risks and vaccinations are no different. Pro-vaccine believes that the odds outweigh the risks drastically. The lowest success rate of 90% is still great odds. Pro-vaccine also relies on vaccine’s rich history. Another commonplace agreed upon by both sides is vaccines past success. Vaccines have eradicated, eliminated, and reduced the incidence of some diseases such as polio.

Other issues that stems from vaccines are: “What vaccinations are necessary during infancy?” and “Is the vaccination schedule safe?” Pro-vaccine believes that all vaccines administered during the vaccination schedule are both safe and necessary. Why would you not want to prevent your child from being protected from the most diseases possible? They also believe that an infant’s immune system, contrary to popular belief, is more than capable of receiving an abundant amount of shots. Anti-vaccine parents are worried about how much is administered during the vaccination schedule. They feel as though it is too much for an infant to handle all at once and all so suddenly. They also feel that not all of the vaccines administered at

such a young age are necessary. They argue that the Hepatitis B vaccine is pointless because it is a sexually transmitted disease.

Some more issues revolve around whether it is more important to protect the individual or the population as a whole. “Should we be more concerned about the protection of the individual from side-effects of the vaccine, or about the protection of the population from the disease?” Pro-vaccine is in favor of protecting the entire population from a dangerous disease. They believe in herd-immunity, “When a critical portion of a community is immunized against a contagious disease, most members of the community are protected against that disease because there is little opportunity for an outbreak.” (Vaccines.gov, 2014) Anti-vaccine groups are in favor of protecting the individual from side-effects caused by the vaccination. Vaccines should be 100% safe before administering them. They also make the argument that herd-immunity only applies to natural immunity, not immunity gained through vaccinations. The theory of herd-immunity is another issue that neither can seem to agree upon.

Another issue that arises from the topic of vaccines is, “Who should decide whether or not to vaccinate children?” Some believe that it should be the government or society’s choice on whether or not to vaccinate a child. It shouldn’t fall on the parent because they are biased. It is all about the greater good, a vaccinated population. Others believe that the decision should be made by the parents because it is their child. It is also uncertain whether we can trust the government or not. An issue tied into this is, “Can we trust the Center for Disease Control and Prevention (CDC)?” Some say that we can trust the CDC as they stand for something bigger than ourselves: the protection of humanity from disease. Others are not so quick to trust. This stems from recent news that the CDC had altered some of their results in a study that focused on the connection of vaccines and autism in young African-American boys. It isn’t that they don’t want to trust the

CDC and our government; it is just that recent news of “stat-correcting” is too troubling to ignore. This is a final commonplace between both sides. They want to believe in the CDC and they want it to be responsible for its higher standards.

In conclusion, there are many issues revolving around vaccines. All of them need to be resolved in order to answer the ultimate question of, “Should we vaccinate our children.” The two sides are so far apart and entrenched in their own thoughts and ideals that it’s almost impossible to come to a resolution. It is important that these issues don’t block out the commonplaces within this argument that are important. The ultimate goal should still be to better the lives of our children and future generations.

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## Part 2

Should we vaccinate our children? About twenty years ago the majority of the population could easily answer this question with a yes. Today I think it is a much harder question to answer. These days, people aren't too quick to agree to vaccinations. While it is smart to think things through, I still believe that it is a good idea to vaccinate our children. If you can protect your child from a dangerous and infectious disease, then why not take advantage of that opportunity? One big issue with vaccinations is the ingredients within the vaccines themselves. In this paper I will be addressing the controversial ingredients within vaccines and why they are safe.

The ingredients within vaccines serve a purpose. This seems to be something that people tend to forget. All ingredients within a vaccine serve a purpose to make the vaccine more efficient. The main ingredients that allow the vaccine to perform more efficiently include: antigens, preservatives, formaldehyde, and adjuvants.

The most vital ingredient within a vaccine is an antigen. The American Academy of Pediatrics describes antigens as, "Antigens make vaccines work. They prompt the body to create the immune response needed to protect against infection. Antigens come in several forms. The form used in a vaccine is chosen because studies show it is the best way to protect against a particular infection." (<http://www2.aap.org/immunization/families/faq/Vaccineingredients>) Antigens are the "weakened" or "inactivated" viruses that infect the body. There are four forms of antigens: Weakened live viruses, Inactivated viruses, Partial viruses, and Partial bacteria.

"Weakened live viruses are too weak to cause disease but can still prompt an immune response. Inactivated (or killed) viruses cannot cause even a mild form of

the disease, but the body still recognizes the virus and creates an immune response to protect itself. Partial viruses are made up of the specific part of the dead virus that will prompt a protective immune response. Partial bacteria are made up of the specific part of the dead bacteria that will prompt a protective immune response.”

(<http://www2.aap.org/immunization/families/faq/Vaccineingredients>)

While it may sound dangerous, infecting your child is not as bad as it sounds. The antigens within vaccines are dead or inactivated. I like to think of it as training for the immune system. The antigens are just punching bags for the immune system. The immune system gets the training that it needs so it will be prepared to easily fight off the real thing if exposed.

Preservatives simply preserve the vaccine. “They keep the vials from getting contaminated with germs.” (<http://www2.aap.org/immunization/families/faq/Vaccineingredients>) Preservatives don’t necessarily affect the vaccine chemically. It seems to protect the vaccine physically, keeping it safe from outside dangers so it may perform. One example of a preservative is the controversial ingredient thimerosal which I will delve into later.

Not only do people fear thimerosal, they also fear formaldehyde. I think that they have limited knowledge of formaldehyde especially in the context of vaccines. Formaldehyde has this bad connotation that it can cause cancer and that just isn’t proven factual yet.

(<http://www.cancer.gov/cancertopics/factsheet/Risk/formaldehyde>) Formaldehyde does serve a purpose, “Formaldehyde is used to detoxify diphtheria and tetanus toxins or to inactivate a virus.” (<http://www2.aap.org/immunization/families/faq/Vaccineingredients>) Furthermore the amounts of formaldehyde within vaccines are miniscule and harmless. “The tiny amount which

may be left in these vaccines is safe. Vaccines are not the only source of formaldehyde your baby is exposed to. Formaldehyde is also in products like paper towels, mascara and carpeting. Our bodies normally have formaldehyde in the blood stream and at levels higher than in vaccines.” (<http://www2.aap.org/immunization/families/faq/Vaccineingredients>) This seems to be common argument against vaccines. The notion that amount of vaccines and the ingredients within them is too much for a young child’s immune system to receive at once. This simply isn’t true.

“Infants and children are exposed to many germs every day just by playing eating, and breathing. Their immune systems fight those germs, also called antigens, to keep the body healthy. The number of antigens that children fight every day (2,000-6,000) is much more than the number of antigens in any combination of vaccines on the current schedule (150 for the whole schedule). So children's immune systems are not overwhelmed by vaccines.”

(<http://www2.aap.org/immunization/families/safety.html>)

Yes it is true that children in this day and age are receiving more total shots than ever before. A total of 14 shots can seem overwhelming but it’s what lies within the vaccines that tell the real story. Paul Offit, a doctor at the Children’s Hospital in Philadelphia, the Division of Infectious Diseases, explains in his journal,

“Also, although the number of recommended childhood vaccines has increased during the past 30 years, with advances in protein chemistry and recombinant DNA technology, the immunologic load has actually decreased. The 14 vaccines given today contain <200 bacterial and viral proteins or polysaccharides,



compared with >3000 of these immunological components in the 7 vaccines administered in 1980.” (<http://cid.oxfordjournals.org/content/48/4/456.full>)

So while the amount of shots has increased, the “immunological load” has decreased drastically. We have doubled the amount of vaccines but have cut down the immunological load about 80%.

Adjuvants, along with many of the ingredients in vaccines, are difficult to understand without some in depth research. I like the definition provided by the National Network for Immunization Information, “Adjuvants serve to: bring the antigen—the substance that stimulates the specific protective immune response—into contact with the immune system and influence the type of immunity produced, as well as the quality of the immune response (magnitude or duration); decrease the toxicity of certain antigens; and provide solubility to some vaccines components.” (<http://www.immunizationinfo.org/issues/vaccine-components/aluminum-adjuvants-vaccines>) Analyzing it in relation to the analogy used for antigens, the antigens are still punching bags or dummies for the immune system to train on. However, something has to bring the punching bags to the immune system and that’s where the adjuvants come in. They not only bring the antigen but they also determine the type and quality of the immune response. Adjuvants are almost like the trainers of the immune system. The reason that adjuvants get so much flack is because the most common adjuvant is aluminum.

“To work as an adjuvant, the antigen must be adsorbed to the aluminum; that is, it is clumped with the aluminum salt to keep the antigen at the site of injection.” (<http://www.immunizationinfo.org/issues/vaccine-components/aluminum-adjuvants-vaccines>)

Referred to as Aluminum Salts, they serve as the main adjuvant in most vaccines. Without Aluminum salts the vaccine would be rendered useless. “Aluminum salts help your body create a

better immune response to vaccines. Aluminum salts are necessary to make some of the vaccines we use more effective. Without an adjuvant like aluminum, people could need more doses of shots to be protected.” (<http://www2.aap.org/immunization/families/faq/Vaccineingredients>)

With all the controversy that surrounds Aluminum, little do people know, it actually assists in the process of reducing the quantity of shots. Ironic isn't it? The amount of shots is a big issue and Aluminum, an ingredient that anti-vaccine groups are worried about, helps their cause.

When looking at this list of vaccines and its ingredients\* the first thing I noticed was how many vaccines contained aluminum on the first page alone.

(<http://www.generationrescue.org/resources/vaccination/vaccine-ingredients-and-side-effects/>)

This can be daunting as receiving too much aluminum can be dangerous. However, with further research I discovered that Aluminum isn't as dangerous as it is made out to be, at least in vaccines. Just like Formaldehyde the amount of aluminum in vaccines is at such a minuscule level that it is harmless. The American Academy of Pediatrics elaborates on the safety of Aluminum in vaccines, “Everyone is exposed to aluminum because there is much aluminum in the earth's crust. It's present in our food, air and water, including breast milk and formula. The amount of aluminum in vaccines is similar to that found in 33 ounces of infant formula.

Aluminum has been used and studied in vaccines for 75 years and is safe.”

(<http://www2.aap.org/immunization/families/faq/Vaccineingredients>) The National Network for Immunization Information has very similar information,

“Aluminum is a very abundant element in our environment. It is in many foods we eat, many personal hygiene products we apply to our skin (deodorants, for example), and many medicines we ingest. Thus, all infants are exposed to aluminum in the environment. Breast milk, for example, contains approximately

40 micrograms of aluminum per liter, and infant formulas contain an average of approximately 225 micrograms of aluminum per liter.”

(<http://www.immunizationinfo.org/issues/vaccine-components/aluminum-adjuvants-vaccines>)

Not only are Aluminum Salts useful but they are also not dangerous. The amount of Aluminum in vaccines is so small that it really doesn't categorize as a risk. The same can be said about Thimerosal.

Probably the biggest controversy when dealing with vaccines is the ingredient Thimerosal. “Thimerosal is a mercury-based preservative that has been used for decades in the United States in multi-dose vials (vials containing more than one dose) of some vaccines to prevent their contamination with germs, bacteria and fungi.”

(<http://www.cdc.gov/flu/protect/vaccine/thimerosal.htm>) The big controversy surrounding Thimerosal is the fact that it contains mercury. This led to people believing that because of the mercury within Thimerosal, that Thimerosal can be very harmful and can cause autism. First addressing the theory that Thimerosal can cause autism; this theory has been debunked. The CDC elaborates on their website, “Evidence from several studies examining trends in vaccine use and changes in autism in children does not support such an association between thimerosal and autism. And a scientific review by the Institute of Medicine (IOM) concluded that ‘the evidence favors rejection of a causal relationship between thimerosal-containing vaccines and autism.’ CDC supports the IOM conclusion that there is no relationship between vaccines and autism rates in children.” (<http://www.cdc.gov/vaccinesafety/concerns/autism/index.html>) Paul Offit also did some research on Thimerosal and found numerous studies done globally that showed no connection between Thimerosal and autism:

Source	Study design	Location
Stehr-Green et al., 2003 [22]	Ecological	Sweden and Denmark
Madsen et al., 2003 [23]	Ecological	Denmark
Fombonne et al., 2006 [9]	Ecological	Canada
Hviid et al., 2003 [24]	Retrospective cohort	Denmark
Verstraeten et al., 2003 [25]	Retrospective cohort	United States
Heron and Golding, 2004 [26]	Prospective cohort	United Kingdom
Andrews et al., 2004 [27]	Retrospective cohort	United Kingdom

(<http://cid.oxfordjournals.org/content/48/4/456.full>)

Now some people fear that, while Thimerosal does not lead to autism, the amount of mercury found in Thimerosal can be dangerous. Thimerosal does contain mercury, but is important to know what type of mercury it contains. “Thimerosal—50% ethylmercury by weight—is an antibacterial compound that has been used effectively in multidose vaccine preparations for >50 years.” (<http://cid.oxfordjournals.org/content/48/4/456.full>) Ethylmercury is what lies within Thimerosal which is vastly different from Methylmercury. “Methylmercury is formed in the environment when mercury metal is present. If this material is found in the body, it is usually the result of eating some types of fish or other food. High amounts of methylmercury can harm the nervous system.”

([http://www.cdc.gov/vaccinesafety/Concerns/Thimerosal/thimerosal\\_faqs.html#b](http://www.cdc.gov/vaccinesafety/Concerns/Thimerosal/thimerosal_faqs.html#b)) Most people’s fear comes from the dangerous side-effects of Methylmercury. Yes Methylmercury is dangerous and people should be afraid of high amounts of Methylmercury, but to relate to Thimerosal is an irrational assumption and fear. Ethylmercury is safer, “However, thimerosal contains ethylmercury which is broken down and leaves the body much more quickly.”

(<http://www2.aap.org/immunization/families/ingredients.html#thimerosal>) Even with the information in favor of Ethylmercury and Thimerosal’s safety the American Academy of Pediatrics and the Public Health Service decided to calm the nerves of the American population

anyway. “Despite the absence of data suggesting harm from quantities of ethylmercury contained in vaccines, in 1999, the American Academy of Pediatrics and the Public Health Service recommended the immediate removal of mercury from all vaccines given to young infants.” (<http://cid.oxfordjournals.org/content/48/4/456.full>) This recommendation was followed by action very quickly, “...in 2001 thimerosal was removed or reduced to trace amounts in all childhood vaccines except for one type of influenza vaccine, and thimerosal-free alternatives are available for influenza vaccine.” (<http://www.cdc.gov/vaccinesafety/concerns/autism/index.html>) There is nothing to fear from Thimerosal. It doesn't cause autism and the dosage is too small to cause any real side-effects.

One thing that is left to be determined is the synergistic effect that all ingredients might have. There have been plenty of tests and studies on individual ingredients but nothing extensive on the combination of ingredients. Synergy is defined as such: “the interaction of elements that when combined produce a total effect that is greater than the sum of the individual elements, contributions, etc.” (<http://dictionary.reference.com/browse/synergy>) It is foolish to believe that there isn't even a small chance that synergy of ingredients could impact vaccines and a child's immune system greatly. Another possible counter argument would be the additive levels of ingredients that a child comes into contact with. The levels of Aluminum in vaccines are lower than what we come into contact with everyday from the Earth, our food, and our water; but what if the combination of both the vaccines and everyday life puts us over the limit of what is safe to receive.

Why do I support vaccinations? Well I definitely have a standpoint and a bit of a bias. I am someone who has been vaccinated while experiencing no serious side effects. I don't know what it is like to experience such a thing. I could try to picture myself in those shoes but it still

wouldn't have the same effect and still wouldn't be the full experience. I sort of relate it to an occurrence I witnessed in *Vaccine War* directed by John Palfreman. They stated that people were not that keen on vaccines because they didn't experience the disease firsthand. Many people who are older experienced the devastation of Polio. They either had Polio or knew someone who had Polio. The newer generations take the vaccines and the dangers they prevent for granted. I feel that I do the same. I don't know how lucky I truly am to live a healthy life.

In conclusion, I think that vaccinations provide more good than bad in our world. I do understand that there are some risks and some of those risks can vary depending on the person. The general population, the majority, should still trust in the benefits of vaccines. For all the people who fear the ingredients in vaccines, there is nothing to worry about. The ingredients in vaccines actually do serve a purpose and make the vaccine more effective. Yes, there are dangerous elements of a vaccine. Aluminum can be toxic in high amounts, but vaccines never get anywhere close to those levels. We find more aluminum in everyday life. Thimerosal, which once was thought as dangerous, is not. Methylmercury can be harmful, but Thimerosal contains Ethylmercury. Even with that, Thimerosal has been reduced or removed in all vaccines but one. The ingredients in vaccines are not harmful to children and therefore it is a good idea to vaccinate.

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# Vaccine Ingredients & Side Effects

## Educate Before You Vaccinate

Vaccines are created with a long list of ingredients. These ingredients can often have potent side effects, both alone and in combination.

<b>Vaccines</b> by multiple manufacturers	<b>Ingredients*</b> partial list in one or more vaccines	<b>Side Effects**</b> including a partial list of reactions, events & reports*
DTaP (Daptacel)	Aluminum phosphate, formaldehyde, glutaraldehyde, 2-phenoxyethanol	Vomiting, redness or swelling, fever, tiredness or poor appetite, seizures, serious allergic reaction, brain damage (very rare).
DTaP (Infanrix)	Aluminum hydroxide, bovine extract, formaldehyde, sodium chloride, glutaraldehyde, polysorbate 80	Fever, vomiting, redness or swelling, tiredness or poor appetite, seizures, serious allergic reaction, pain, shock.
DTaP (Tripedia)	Aluminum potassium sulfate, ammonium sulfate, bovine extract, formaldehyde, gelatin, peptone, polysorbate 80, sodium phosphate, thimerosal	Redness or swelling, tiredness or poor appetite, vomiting, fever, seizures, allergic reaction, erythema, persistent crying.
DTaP-HepB-IPV (Pediatrix)	Aluminum hydroxide, aluminum phosphate, calf serum, lactalbumin hydrolysate, formaldehyde, glutaraldehyde, neomycin sulfate, sodium chloride, polymyxin B, polysorbate 80, yeast protein	Drowsiness, fainting, irritability, fever, swelling, joint pain, body aches, loss of appetite, nausea, vomiting, diarrhea, seizures, upper respiratory tract infection, shock, brachial neuritis.
Hib vaccine (ACTHib)	Ammonium sulfate, formaldehyde, sucrose, thimerosal	Fever, diarrhea, erythema, tenderness, swelling, irritability, loss of appetite, sleepiness, seizures, vomiting.
Hib (PedvaxHib)	Aluminum hydroxyphosphate sulfate, sodium chloride	Fever, diarrhea, erythema, tenderness, swelling, irritability, loss of appetite, sleepiness, seizures, vomiting.
Hib/Hep B (Comvax)	Amorphous aluminum hydroxyphosphate sulfate, amino acids, dextrose, formaldehyde, hemin chloride, mineral salts, nicotinamide adenine dinucleotide, potassium aluminum sulfate, sodium borate, soy peptone, yeast	Extreme drowsiness, fainting, irritability, fever, swelling, diarrhea, loss of appetite, mild vomiting, joint pain, body aches, seizures, ear infections, upper respiratory infection, yeast infection, anaphylaxis.

	protein	
Hepatitis A vaccine (Havrix)	Aluminum hydroxide, amino acid supplement, formalin, MRC-5 cellular protein, neomycin sulfate, phosphate buffers, polysorbate 20	Fever, drowsiness, loss of appetite, irritability, allergic reaction (very rare).
Hepatitis A vaccine (Vaqta)	Amorphous aluminum hydroxyphosphate sulfate, bovine albumin or serum, formaldehyde, MRC-5 cellular protein, sodium borate, sodium chloride	Fever, erythema, drowsiness, loss of appetite, irritability, allergic reaction (very rare).
Hepatitis B vaccine (Engerix-B)	Aluminum hydroxide, phosphate buffers, yeast protein, sodium chloride, sodium dihydrogen phosphate dihydrate	Fever, insomnia, hypotension, abdominal pain, stiffness, drowsiness, loss of appetite, irritability.
Hepatitis B vaccine (Recombivax)	Amorphous aluminum hydroxyphosphate sulfate, amino acids, dextrose, formaldehyde, mineral salts, potassium aluminum sulfate, soy peptone, yeast protein	Soreness, mild fever, diarrhea, fatigue/weakness, loss of appetite, respiratory illness, insomnia.
Human papillomavirus (HPV) (Cervarix)	Aluminum hydroxide, amino acids, lipids, mineral salts, sodium dihydrogen phosphate dehydrate, sodium chloride, type 16 viral protein L1, type 18 viral protein L1, vitamins	Pain, redness, and swelling, fatigue, fever, gastrointestinal symptoms, headache, arthralgia, myalgia, urticaria.
Human papillomavirus (HPV) (Gardasil)	Amino acids, amorphous aluminum hydroxyphosphate sulfate, carbohydrates, L-histidine, mineral salts, polysorbate 80, sodium chloride, sodium borate, vitamins, yeast protein	Headache, easy bruising or bleeding, weakness, fever, chills, body aches, nausea, vomiting, insomnia, erythema, pruritus.
Influenza vaccine (Afluria)	Beta-propiolactone, calcium chloride, dibasic sodium phosphate, egg protein, sodium chloride, monobasic potassium phosphate, monobasic sodium phosphate, neomycin sulfate, polymyxin B, potassium chloride, sodium taurodeoxychoalate, thimerosal (multi-dose vials only)	Tenderness, pain, redness, and swelling. headache, malaise, muscle aches, irritability, rhinitis, fever, cough, loss of appetite, vomiting/diarrhea, headache, muscle aches, sore throat, seizures.

Influenza vaccine (Fluarix)	Formaldehyde, gentamicin sulfate, hydrocortisone, octoxynol-10, a-tocopheryl hydrogen succinate, polysorbate 80, sodium deoxycholate, ovalbumin	Pain, swelling, redness, muscle aches, fatigue, headache, irritability, loss of appetite, and drowsiness, fever, shivering, arthralgia.
Influenza vaccine (Fluaval)	Formaldehyde, a-tocopheryl hydrogen succinate, polysorbate 80, sodium deoxycholate, thimerosal, ovalbumin	Pain, redness, swelling, fatigue, headache, muscle aches/arthralgia, irritability, drowsiness, loss of appetite, malaise, sore throat, cough, chills, chest tightness.
Influenza vaccine (Fluvirin)	Beta-propiolactone, egg protein, neomycin, nonylphenol ethoxylate, polymyxin, thimerosal (multi-dose containers), thimerosal[2] (single-dose syringes)	Pain, Inflammation, Ecchymosis, Edema, Hemorrhage, Headache, Fatigue, Malaise, Myalgia, Fever, Arthralgia, Sweating, Erythema, Swelling, Induration, Pruritus, Shivering.
Influenza vaccine (Fluzone)	Egg protein, formaldehyde, gelatin (standard formulation only), octylphenol ethoxylate (Triton X-100), sodium phosphate, thimerosal (multi-dose containers only)	Tenderness, erythema, swelling, induration, ecchymosis, fever, vomiting, abnormal crying, drowsiness, loss of appetite, irritability, pain, pruritus, headache, malaise, myalgia.
Influenza vaccine (FluMist)	Arginine, dibasic potassium phosphate, egg protein, ethylene diamine tetraacetic acid, gentamicin sulfate, hydrolyzed porcine gelatin, monobasic potassium phosphate monosodium glutamate, sucrose, ovalbumin	Runny nose or nasal congestion, fever, sore throat, wheezing, decreased appetite, irritability, lethargy, headache, muscle aches, chills, cough.
Meningococcal vaccine (Menactra)	Formaldehyde, ammonium sulfate, phosphate buffers	Tenderness, erythema, swelling, irritability, abnormal crying, drowsiness, appetite loss, vomiting, fever, induration, diarrhea, headache, fatigue, malaise, and arthralgia, rash, seizures.
Meningococcal vaccine (Menomune)	Lactose, sodium chloride, thimerosal (multi-dose vial only)	Pain, tenderness, erythema, induration, headaches, malaise, chills, fever.
Meningococcal vaccine (Menveo)	Amino acids, formaldehyde, yeast extract	Headache, tenderness, erythema, irritability, sleepiness, persistent crying, change in eating habits,

		vomiting, diarrhea, pain, induration, malaise, myalgia, nausea.
		Fever, headache, dizziness, malaise, irritability, diarrhea, vomiting, parotitis, nausea,
MMR vaccine (MMR-II)	Amino acids, fetal bovine serum, glutamate, hydrolyzed gelatin, neomycin, sodium chloride, recombinant human serum albumin, sodium phosphate, sorbitol, sucrose, vitamins	arthralgia, myalgia, edema, thrombocytopenia, arthritis, panniculitis, encephalopathy, Guillain-Barré Syndrome, seizures, ataxia, polyneuritis, paresthesia.
MMRV vaccine (ProQuad)	Bovine calf serum, dibasic potassium phosphate, dibasic sodium phosphate, human albumin, human serum albumin, hydrolyzed gelatin, dibasic potassium phosphate, monosodium L-glutamate, sodium chloride, MRC-5 cellular protein, neomycin, sodium bicarbonate, sorbitol, sucrose, potassium chloride	Pain, tenderness, soreness, swelling, irritability, fever, measles-like rash, seizures, erythema, ecchymosis, upper respiratory infection, viral exanthema, diarrhea, rhinorrhea.
Pneumococcal vaccine (Pneumovax)	Bovine protein, phenol	Pain, soreness, tenderness, swelling, induration, headache, erythema, asthenia, fatigue, myalgia, chills, upper respiratory infection, chest pain, depression, tremors, stiffness, sweating.
Pneumococcal vaccine (Pneumovax)		Irritability, tenderness, decreased appetite, decreased sleep, increased sleep, fever, redness, pain, fatigue, headache, muscle pain, joint pain, swelling, limitation of arm movement, chills, rash, bronchiolitis, gastroenteritis, pneumonia.
Pneumococcal vaccine (Pneumovax)	Aluminum phosphate, ammonium sulfate, casamino acid, polysorbate 80, succinate buffer, yeast	
Polio vaccine (IPV - Ipol)	Calf serum protein, formaldehyde, neomycin, 2-phenoxyethanol, polymyxin B, streptomycin	Erythema, induration, pain, fever, irritability, sleepiness, fussiness, persistent crying, swelling, loss of appetite, vomiting, tenderness.
Rotavirus vaccine (RotaTeq)	fetal bovine serum, sodium citrate, sodium phosphate monobasic monohydrate, sodium hydroxide, sucrose,	Diarrhea, vomiting, irritability, otitis media, nasopharyngitis, bronchospasm, bronchiolitis, gastroenteritis, pneumonia, fever, urinary tract infection,

	polysorbate 80	allergic reactions, and a serious problem called intussusception, which may be indicated by: vomiting, bad diarrhea, severe stomach pain, and blood in the stool.
Rotavirus vaccine (Rotarix)	Amino acids, dextran, sorbitol, sucrose sodium chloride, potassium chloride, magnesium sulfate, ferric (III) nitrate, sodium phosphate, sodium pyruvate, D-glucose, concentrated vitamin solution, L-cystine, L-tyrosine, L-glutamine, calcium chloride, sodium hydrogenocarbonate, phenol red, PCV-1, calcium carbonate, sterile water, xanthan.	Fussiness, irritability, cough, runny nose, fever, loss of appetite, vomiting, diarrhea, idiopathic thrombocytopenic purpura, Kawasaki disease, and intussusception, which may be indicated by: vomiting, bad diarrhea, severe stomach pain, and blood in the stool.
Tdap vaccine (Adacel)	Aluminum phosphate, formaldehyde, glutaraldehyde, 2-phenoxyethanol, casamino acids, dimethyl beta-cyclodextrin, ammonium sulfate, phenoxyethanol	Pain, swelling, erythema, headache, body aches, muscle weakness, tiredness, fever, chills, sore joints, nausea, lymph node swelling, diarrhea, vomiting, rash, edema, hypotension, muscle spasms, Guillain Barré syndrome, brachial neuritis.
Tdap vaccine (Boostrix)	Aluminum hydroxide, bovine extract, sodium chloride, formaldehyde, glutaraldehyde, polysorbate 80	Pain, redness or swelling at the injection site, fever, headache, tiredness, nausea, vomiting, diarrhea, stomachache, chills, body aches, sore joints, rash, gastrointestinal symptoms, allergic reaction (rare).
Varicella vaccine (Varivax)	Dibasic sodium phosphate, ethylenediamine tetraacetic acid sodium (EDTA), fetal bovine serum, gelatin, glutamate, monobasic potassium phosphate, monobasic sodium phosphate, monosodium L-glutamate, MRC-5 DNA and cellular protein, neomycin, sodium chloride, phosphate, potassium chloride, sucrose	Headache, Varicella-like rash, fatigue, cough, myalgia, disturbed sleep, nausea, diarrhea, chills, eye complaints, loss of appetite, itching, vomiting, constipation, rashes, respiratory illness, cold/canker sore, seizures, secondary bacterial infections.
Zoster (Shingles) vaccine (Zostavax)	Bovine calf serum, sodium chloride, dibasic sodium phosphate, hydrolyzed porcine gelatin, monosodium L-glutamate, MRC-5 DNA and	Redness, soreness, swelling or itching at the site of the injection, headache, rash, erythema, pruritis, warmth,

cellular protein, monobasic      hematoma, induration.  
potassium phosphate,  
neomycin, potassium chloride,  
sucrose